WINTER 2021-2022 RESOURCE RELIABILITY RISK ASSESSMENT

ReliabilityFirst (RF) performs an annual seasonal winter reliability assessment to ensure that its footprint has adequate resources to serve anticipated load demand. RF developed this assessment collaboratively with data provided from both PJM and MISO. This article shares some highlights from MISO, PJM, and RF assessments.

For the upcoming winter of 2021-2022, both MISO and PJM are expected to have an adequate amount of resources to satisfy their respective planning reserve requirements. However, if the upcoming winter of 2020-2021 experiences a higher than anticipated load demand and outages, there is a small likelihood that the MISO area will need to utilize Demand Response to meet resource adequacy. The outage risk assessment outlined below, further assess the capability of both MISO and PJM to meet their planning reserve requirements under a random outage scenario based on actual Generator Availability Data System (GADS) outage data.

PJM Capacity and Reserves

Net Capacity Resources[1]	176,309 MW
Projected Peak Reserves	52,143 MW
Net Internal Demand (NID)	124,166 MW
Planning Reserve Margin	42.0%

The PJM forecast planning reserve margin of 42.0% is greater than the 14.7% margin requirement for the 2020 planning year. The planning reserve margin for this winter is lower than the 2020 forecast level of 49.5%. This is due to a decrease in existing certain generation and the increase of sales of capacity to entities outside of PJM. A decrease in generation produced by burning coal participating in PJM capacity market is the largest driver of a decrease in existing generation.

[1] Net capacity resources include existing certain generation and net scheduled interchange.

As a result of increasing reports of existing and future supply shortages of fuel and non-fuel consumables going into the 2021-2022 winter season, PJM has initiated a Generation Resource Weekly Fuel Inventory and Supply Data Request. The weekly requests start October 11, 2021 and will run through February 28, 2022, and apply to all coal and oil resources (including dual-fuel units).

MISO Capacity and Reserves

Net Capacity Resources	140,818 MW
Projected Peak Reserves	43,486 MW
Net Internal Demand (NID)	97,332 MW
Planning Reserve Margin	44.7%

The MISO forecast planning reserve margin of 44.7% is greater than their margin requirement of 18.3% for the 2021 planning year. The planning reserve margin for this winter is lower than the 2020 forecast level of 48.5%. This is mostly due to a decrease in existing certain generation in MISO's footprint. A decrease in generation produced by burning coal participating in MISO market is the largest driver of a decrease in existing generation.

RF Footprint Resources

Net Capacity Resources	192,668 MW
Projected Peak Reserves	57,436 MW
Net Internal Demand (NID)	135,232 MW
Total Internal Demand (TID)	143,860 MW

Since both PJM and MISO projections have adequate resources to satisfy their respective forecasted planning reserve margin requirements, the RF Region is projected to have sufficient resources for the 2021-2022 winter period.

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Random Generator Outage Risk Analysis

The following analysis evaluates the risk associated with planned and random forced outages that may reduce the available capacity resources below the load demand obligations of PJM or MISO. Reports and/or other data released by PJM, MISO or NERC for this same period may differ from the data reported in this assessment due to different assumptions that were made by RF from the onset of the report. This analysis differs from NERC's in that RF uses actual historical GADS data from a rolling five year period which provides a range of outages that occur during the winter period.

Exhibits 1 and 2 are based on forecasted winter 2021-2022 demand and capacity resource data for the PJM and MISO areas. The daily operating reserve requirement for PJM and MISO at the time of the peak demand is also included as a load obligation. The range of expected generator outages is included for scheduled and random forced outages. The random forced outages are based on actual NERC GADS outage data from December, January, and February of 2016 through 2020.

The committed resources in PJM and MISO are represented by the Resources bar in shades of blue and only include the net interchange that is a capacity commitment to each market. Additional interchange transactions that may be available at the time of the peak are not included, as they are not firm commitments to satisfying each areas reserve margin requirement.

The firm demand and the demand that can be contractually reduced as a Demand Response (DR) are shown in shades of green. The firm demand constitutes the Net Internal Demand (NID), with Total Internal Demand (TID) including the effects of DR. The daily Operating Reserve requirement (shown in yellow) is between the NID and DR bars. There are two sets of stacked Demand bars on the chart, one representing the 50/50 demand forecast and one representing the 90/10 demand forecast. For instance, the 50/50 demand forecast projects a 50% likelihood that demand exceeds the forecast (e.g., 124,166 MW for PJM). The 90/10 demand forecast is a more conservative model, projecting a 10% chance that demand exceeds the forecast (e.g., 134,599 MW for PJM). Since DR is utilized first to reduce the load obligation when there is insufficient capacity, this part is at the top of the Demand bar. In the event that utilization of all DR is not sufficient to balance capacity with load obligations, system operators may first reduce operating reserves prior to interrupting firm load customers.

Between the Resources bar and the Demand bars is the Outage bar. While scheduled outages during the winter season are generally minimal, there are a small number of outages that extend during the winter, which are reflected in the Scheduled Maintenance (colored gray) in the Outage bar. The remainder of the Outage bar represents the entire range of random forced outages. Pink shows 100% of the random forced outages while rose shows less than 100% down to 10% of the random forced outages. Additionally red shows less than 10% down to 0.2% of the random forced outages on the chart. All of the above occurred during the five-year reference period.

In the following discussion of the random forced outages, the analysis of random forced outages exceeding certain reserve margin targets is presented as a possibility. These are not based on a true statistical analysis of the available daily random outage data. Rather than statistical probabilities, these numbers represent the percentage of the daily outages during the five prior winter periods that would have exceeded the reserve margin that is listed. They are discussed as probabilities as a matter of convenience in describing the analysis results.

To the left side of the range of random forced outages are probability percentages related to the amount of random forced outages that equal or exceed the amount of outages shown above that line on the Outage bar. Moving from top to bottom of the Outage bar represents an increasing amount of random forced outages, with a decreasing probability for the amount of random forced outages. In the PJM chart, the random forced outages represented by the bar above the 100% point is 520 MW. This means that the probability of there being at least 520 MW of random generation outages is 100%. Similarly, at the 10% point, the outages represented by the bar above the 10% point is 20,094 MW (520 MW + 19,574 MW). There is a 10% probability that there will be at least 20,094 MW of outages. As shown by the probabilities and corresponding amounts of random forced outages, the distribution of random forced outages is not linear throughout the range of outages observed.

To the right of the Outage bar are the probabilities of the random generation outages that correspond to different levels of demand obligation. In Exhibit 1 for PJM, there is a minimal risk that the amount of outages would require demand response for both the 50/50 and the 90/10 demand forecast for the upcoming winter.

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Exhibit 1 - 2021/2022 Winter PJM Resource Availability Risk Chart

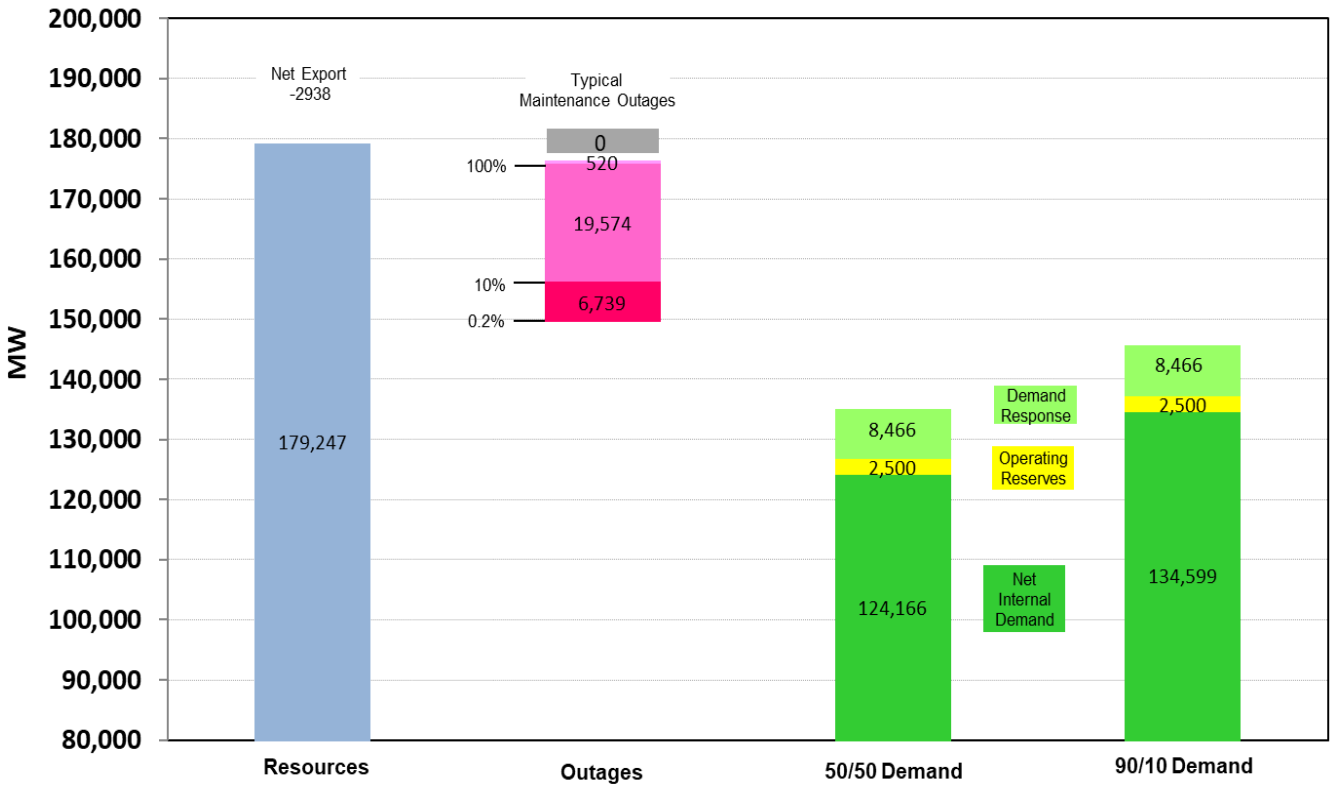

Exhibit 2 contains the information to perform the same analysis for MISO. The top of the 90/10 demand obligation with the operating reserves has a 4% probability that DR will be required during high demand.

Exhibit 2 - 2021/2022 Winter MISO Resource Availability Risk Chart